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ABSTRACT

Eleven common characteristics of instructional program systems have been identified: outcomes, instruction, quality verificiation, monitoring, personnel, data, interfaces, procurement, information, continuity, and costs. The requirements, specifications, and procedures of these must all be made explicit for each system. Although the eleven system characteristics enumerated are easily differentiated for explanatory purposes, it is important to note that they are interdependent and that the specifications for one are considerably dependent upon the specifications for another. The same is true of the systems themselves; there, too, interdependency between and among the systems requires careful analytic attention and subsequent procedural attention. (Author/RB)

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CHARACTERISTICS OF EDUCATIONAL PROGRAM SYSTEMS

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ABSTRACT

Five program systems have been identified (TN-1-70-2): instructional, training, installation, accountability, and modification. Although they have distinct functions in instruction and development, they share certain common characteristics. These commonalities provide structures which development personnel can use in designing their systems and organizing their activities. Eleven common characteristics of instructional program systems have been identified, the requirements, specifications, and procedures of which must all be made explicit for each system.

Although the eleven system characteristics enumerated are easily differentiated for explanatory purposes, it is important to note that they are interdependent and that the specifications for one are considerably dependent upon the specifications for another. The same is true of the systems themselves; there too interdependency between and among the systems requires careful analytic attention and subsequent procedural attention.

CHARACTERISTICS OF EDUCATIONAL PROGRAM SYSTEMS

Robert L. Baker

1. OUTCOMES. Explicit statements of the outcomes, or the expectations for a system, are required. Such statements should be precise, defining all performance characteristics operationally. When the outcome is a product (e.g., learner responses to a test or a term paper), its characteristics should be fully described and the tolerance limits of an acceptable product specified. When the outcome is a process (e.g., inquiry techniques or teacher-learner planning), it is equally necessary to define its identifying characteristics fully. It is especially important to go beyond the use of a slogan, which tends merely to obscure the complexity of a poorly understood and inadequately described phenomenon. Sometimes the characteristics of the process outcome can be assessed simply in terms of their presence or absence. Statements of outcomes are critical, for they constitute the basis for all other systems' specifications.

2. INSTRUCTION. This characteristic--common, like the others, to all systems--includes all the instructional specifications, the prototype materials and methods designed to conform to the specifications, the production of materials and procedures in a form suitable for appropriate testing, the actual testing of prototype materials and procedures, and the resultant instructional product--packaged and introduced in such a way as to make it attractive to the learner. Prototype testing involves the administration of criterion referenced tests to a representative target population, and the initial tryout of prototype instruction with a single learner or a single group of learners. All prototype materials must be in a replicable form. That is, the developer may not specify that a "creative" or a "well-educated" teacher is required unless he indicates precisely how such creative behavior can be identified.

3. QUALITY VERIFICATION. No system element, either in education or any other context, is likely to function adequately the first time it is tried under natural conditions. Quality verification activities therefore involve the successive trial-revision cycles required to bring a system or its elements to an acceptable level of performance under complex "real-world" conditions. Within the corrective cycles designed to identify and eliminate defects until the system satisfies current user requirements adequately, the three key concepts are tryout, evaluation, and revision.

4. MONITORING. This characteristic refers to the development and deployment of various techniques to keep system efficiency at a high level, consistent with state-of-the-art resources. Emphasis usually falls upon the identification of monitoring requirements which will

identify and effect desirable system changes. Especially critical is the definition of decision rules (e.g., given outcome X, procedure Y is required) to insure achievement of en route outcomes and the design of materials and procedures necessary to implement the decision rules.

5. PERSONNEL. The present view of instructional product development engenders a different view of human resource utilization than has been characteristic in the past. The outcome-referenced methods and materials, comprising an instructional program or system in the modern sense, constitute a base for the management of human resources which will lead to more efficient administration of instruction and a greater likelihood that the prespecified outcomes will be attained. Our view of the human resource network moves from the involvement of individuals at the instructional level, to the involvement of staff groups at the support level, to the involvement of institutions at the agency level. Each part of the network has defined responsibilities for promoting or verifying the desired outcomes of each aspect of the particular system. By making specific provisions for all individuals involved in the system, the network helps insure that the human resources for satisfying accountability requirements can be increased dramatically. It is thus apparent that, in addition to satisfying the requirements related to the assignment and scheduling of personnel, this view of a functional human resource network generates new professional training requirements as well as new job functions.

6. DATA. Each of the five instruotional program systems has its own unique data requirements. No matter how special their requirements may be, however, it is apparent that one system's data requirements will necessarily involve the data requirements of one or more of the other systems. Especially critical are the mechanisms and procedures utilized by a system for the collection and analysis of data. It is always important to specify the data requirements fully as they suggest potential interference with the operations of other systems. It is also important to specify the resource requirements, primarily personnel, materials, and computers. Finally, data analysis must generate information that is usable, not merely reportable.

7. INTERFACES. This characteristic refers to important, but frequently ignored factors stemming from the fact that each program system, as we have seen, entails requirements that must be related in some way to existing programs, policies, and people. Thus an analysis of the new system requirements as reflected against existing structures is vital. Objectives growing out of this analysis will generate suggested revisions in prevailing instructional, personnel, and administrative policies. Where present structures are inviolate, revisions must be made in the system.

8. PROCUREMENT. Inasmuch as each of the systems has both common and unique resource requirements, it is important to predetermine requirements, insofar as is possible, and to study the feasibility of establishing procurement procedures. Emphasis in this area falls upon the specification of procurement procedures and the allocation of nonhuman resources.

9. INFORMATION. Both the developer of instructional systems and the consumer-participant have specific information requirements. In each case, the concern is with a certain kind of information, as well as with some general public information commonly disseminated by most public information offices. Because the interrelationships between the various elements of the systems reflect the total environment in which any system's utility must be proven, it is important that outcomes be specified, and that materials and procedures be developed, for use in describing a system at a "public information" level, suitable for at least the governance group and the general public. Also necessary will be an information level for the operating staff and interested professional sectors which will include sufficient description for an understanding of the technical aspects of the systems. Finally, although it is not easy to establish communication with a user who has a different set of values and frame of reference from the developer, communication must be established here too; usually, the producer will have to initiate the communication.

10. CONTINUITY. In an effective development effort, one always has the "next generation" product underway before the "current generation" product is fully developed. This progressive accumulation of development effort requires not only a criterion referenced outlook but a continuous development operational procedure which has not existed in education heretofore. This kind of continuous refinement of a product or system requires clearly prespecified procedures relating to documentation, analysis, and reporting. Central to this characteristic are strategies for devising effective modifications in tryout and revision procedures, statements of next steps in development, and statements of changes to be incorporated in the product or in system procedures.

11. COSTS. Because costs constitute a sensitive area for the consumer, they require full attention on the part of the producer. Assuming that one has sufficient evidence that a system yields dependable results, he must ask: what are the costs involved in such a yield? This area requires identification of the various cost factors and ratios. One critical set of outcomes suggested by the not-yet fully validated concept of "cost effectiveness" and not yet represented by a well defined set of formulae, is the relationship between the utility and the reliability of a system's effect and its associated direct and indrect costs. Increasing attention needs to be devoted to objectives and procedures focusing on that relationship.

SYSTEM CHARACTERISTICS

PROGRAM SYSTEMS	1 OUTCOMES	2 INSTRUC-TION	3 QUALITY VERIFICA-TION	4 MONITORING	5 PERSONNEL	6 DATA	7 INTERFACES	8 PROCURE-MENT	9 INFORMA-TION	10 CONTINUITY	11 COSTS
Instructional											
Training											
Installation			A								
Accountability											
Modification											

FIGURE 1. A Guide for the Specification of Instructional Program Requirements, Materials, and Procedures

The two dimensions described above--instructional program systems and systems characteristics--can be represented graphically in a two-way matrix guide which facilitates the specification of requirements, outcomes, and procedures unique to each intersection. Figure 1 illustrates the interrelations of program systems and system characteristics in this fashion. Look, for example, at the cell outlined and lettered A, relating to the following two-dimension intersection:

I	Program System	⟶	"Installation"
II	System Characteristic	⟶	"Quality Verification"

The requirements for this cell are dependent, first and foremost, upon the tasks that must be specified. We know that potentially this cell includes tasks as diverse as, say, an analysis of the instructional program in order to determine appropriate points for various assessments, and, perhaps, the development of teacher performance scales to be used in determining effectiveness of specified installation procedures. The second question, clearly, is who is going to perform the task. Instructional development is so specialized that we should no longer accept the inadequacies of the "one on one" offense. A development team should be assembled, and the responsibilities of its members differentiated, in such a way that maximum expertise is applied at all points. In turn, this creates management requirements designed to insure that the specialized work of one becomes the sequenced work of all, rather than the diffused work of everyone.